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Using Blended Learning to Take Advantage of Learning Science Research

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Using Blended Learning to Capitalize on Learning Science Research

Blended Learning in the Liberal Arts Conference • 20 May 2013

Why Does Blended Learning Work?

- Hypothesis 1: Students spend more time on task
 - Claims/evidence mixed, usu. based on self-reporting (Amaral and Shank 2010, Dillard-Eggars et al. 2011)
 - In our study online work was often **substitute** for paper-based, not additional
 - Due to blending itself or broader redesign?
 - Garnham and Kaleta (2002) goal is active learning
 - Delialioglu (2012) difference in time on task related to active learning component

Why Does Blended Learning Work?

- Hypothesis 2: Students are using time outside of class more effectively
 - Online component of blended courses often incorporates formative assessment
 - Memory and learning science research suggest that formative assessment enhances learning
 - Faculty can structure/use assessment to maximize this effect

Formative Assessment

- Goal is gathering evidence in order to improve student learning (Black and Wiliam 1998)
 - At individual level (feedback, adaptive learning)
 - At course level (agile teaching, course redesign)
- Element of BL faculty and students found most valuable in our surveys

Formative Assessment at Work

Feedback and customization for individual student:

Explanation of wrong answer ...

Your answer :

The concentration of Fe in the compound, expressed as a percent.

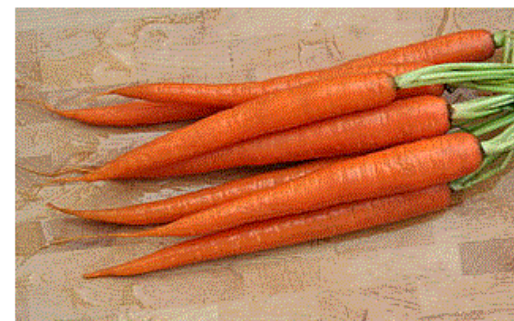
Not quite. 'Concentration' refers to mass or moles present per unit volume. Click on Continue to see an analogy that may help you understand what mass % means.

... and
redirection
to quick
remedial
lesson

Mass Percent Review

To understand the concept of mass percent, it may help to first think of a more familiar example. Let's say you have a produce shipment of 50 kg of bananas, 40 kg of lettuce and 30 kg of carrots.

What is the mass percent of carrots in that shipment?



Formative Assessment at Work

Feedback instructor can use to adjust approach, identify struggling students, etc.

Question 2

aerobic met

1

not in animals

0

photosynthesis

1

produce ATP

14

Mitochondria

- A. ☐ play no role in aerobic metabolism
 B. ☐ are the site of photosynthesis in green plants
 C. ☐ oxidize fuel to produce energy (ATP).
 D. ☐ do not exist in animals

Question 3

cell wall/membrane

1

endo ret/DNA rep

5

golgi/periplasmic sp

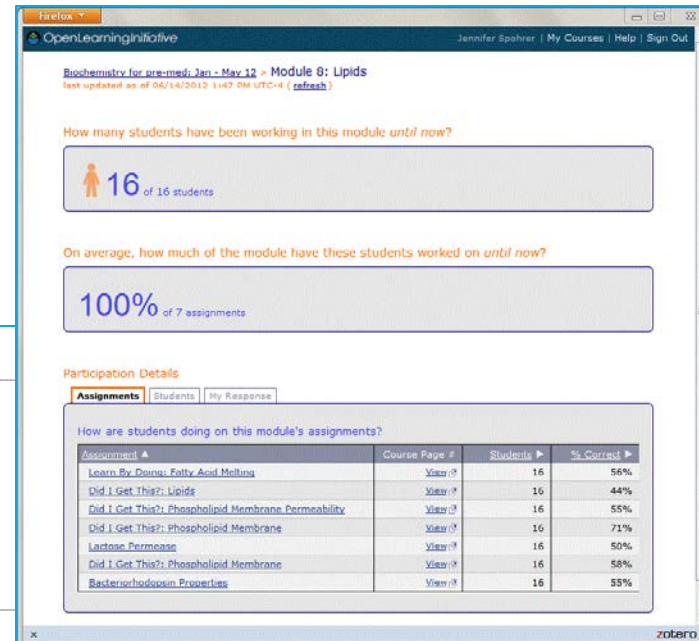
0

ribo/cell memb

10

Which of the following are found in both prokaryotic and all eukaryotic cells.

- A. ☐ cell wall, cell membrane
 B. ☐ endoplasmic reticulum, DNA replication.
 C. ☐ golgi, periplasmic space
 D. ☐ ribosomes, cell membrane



16 responses, 62% correct

Cognitive/Learning Science Research

- Roediger et al. (2011) testing improved
 - Retention of concepts and skills
 - Learning in subsequent study
 - Application of knowledge in subsequent settings
- Greater effect than other study mechanisms
 - Re-reading
 - Highlighting, outlining, or concept mapping

Testing as “Retrieval Practice”

- Even in controlled lab studies, “testing” and “retrieval practice” could involve open-ended questions
- Any activity that requires learner to recall or articulate previous learning
 - Quiz requiring student to match word pairs
 - Prompt to explain a term or concept

Why does it Work?

- Roediger et al. (2011) identifies several direct and indirect mechanisms, key are:
 - “Testing effect”
 - Feedback on learning
 - Spacing learning over time
 - Support for metacognition

“Testing Effect”

- Act of recalling information helps strengthen neural processing of that information
- Testing is active-learning process, produces new learning
- Learner evaluates and reorganizes information in process of retrieving
 - Studies comparing quizzing and mind-mapping

Feedback on Learning

- Testing effect independent of whether learner gets feedback on answer
- Feedback important for
 - Helping students catch and correct misperceptions
 - Strengthening retention of answers that were correct but low-confidence

Spacing Learning over Time

- Periodic assessment strengthens testing effect
 - Short-term vs. long-term memory
 - Rawson and Dunlosky (2012) ideal is testing until correctly answered once initially and 3-4 times on retests after delay
- Counteracts students' tendency to fall behind and cram

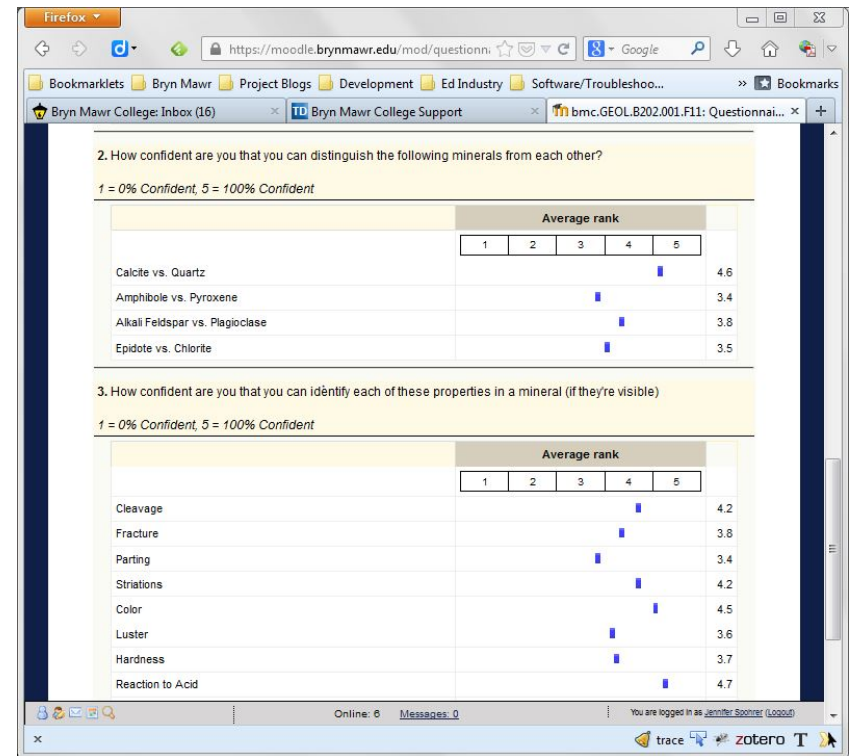
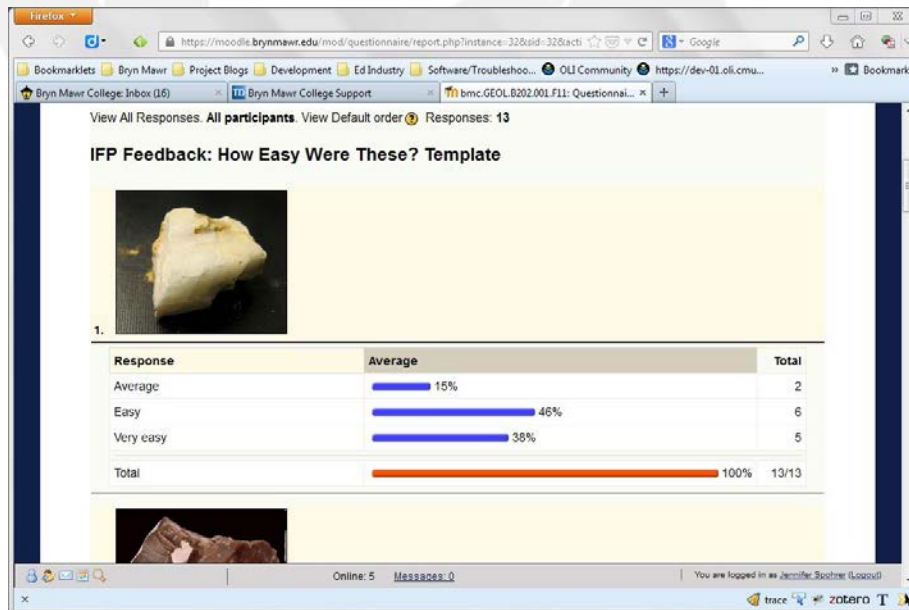
Support for Metacognition

- Good metacognition seen in expert learners
- Novice learners overestimate what they have understood, quizzes correct for this
- Assessments can be designed to help students develop better metacognition skills and habits:
 - Ex. “How confident are you about this answer?”
 - Ex. Assessment post-mortems

Enhancing Metacognition

Self-assessments

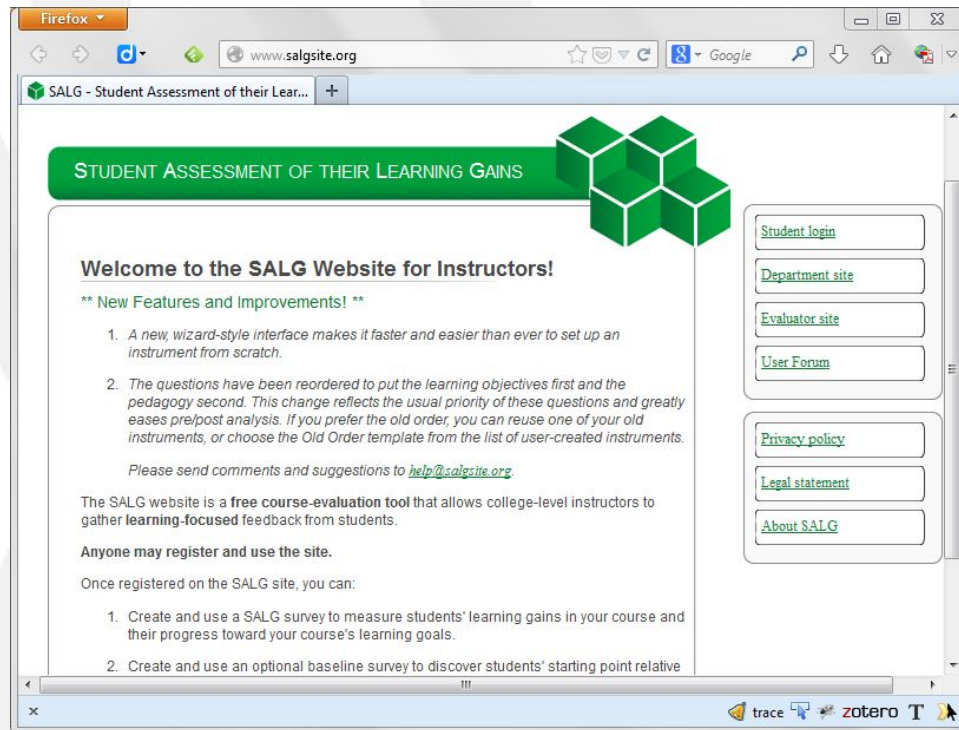
Polls about activities/assessments



In-class: minute papers, muddy points, etc.

Enhancing Metacognition

www.salgsite.org



Or use adaptations of Classroom Assessment Techniques (CATs):

- Minute Paper
- Muddiest Point
- Application

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